

Ultra-Lightweight Large Aperture Support Structures, Phase I

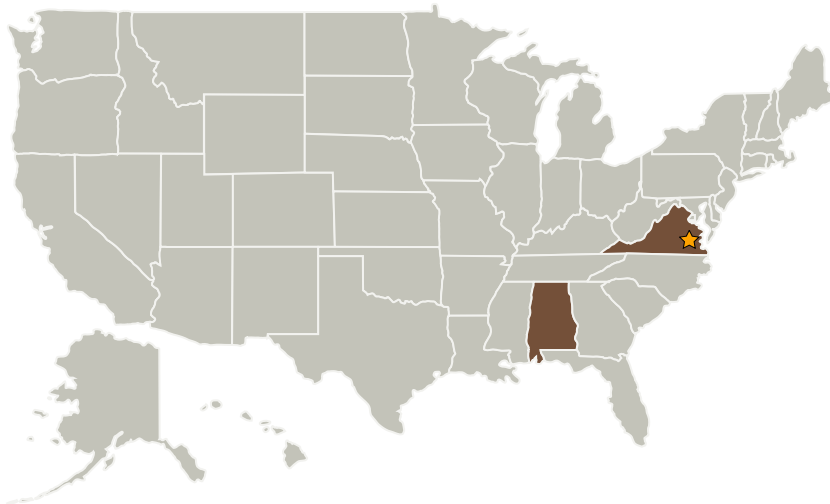
Completed Technology Project (2004 - 2004)



Project Introduction

Ultra-lightweight membranes may prove to be very attractive for large aperture systems, but their value will be fully realized only if they are mated with equally high strength, low-mass support structures. The objective of this proposal is to demonstrate the feasibility of a new innovative structure concept using space qualified flexible thin film polyimide to produce large ultra-lightweight inflation deployed self-rigidizing structural tubes/booms with very low areal density, small packaging volume, and extremely high buckling/bending strength to accurately deploy and provide precision structural support to very large aperture systems. This material can be thermally formed to virtually any shape to produce booms, elbows, tees, flanges, and flat or curved panels to support or connect aperture system components and facilitate in-space assembly. Thermally formed polyimide (TFP) tubes are deflated for launch packaging, pressurized for deployment, and then self-rigidizing for the operational lifetime without any maintenance gas required. This innovative collapsible/deployable structure can potentially revolutionize the manufacture and use of structures for space applications. Phase-I will result in design, fabrication, and testing of sub-scale tubes and modular multifunction components. Phase-II will produce and demonstrate full-scale mission applicable tubes, booms, or truss assemblies and associated interface hardware.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
United Applied Technologies, Inc.	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	Virginia
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Larry J Bradford

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes